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NAVAL AIR ENGINEERING CENTER

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16 JUN 1964

From: Commanding Officer, Naval Air Engineering Center, Phila., Pa. 19112
To: Chief, Bureau of Naval Weapons (RRMA-53)

Subj: PAN 12-61, Accelerated Test for Corrosion Protection Value of Organic Coatings, Development of; Report No. NAEC AML 1951, Additional Studies in the Development of an Accelerated Test for the Corrosion Protection Value of Organic Coatings

Ref: (a) BUWEPS ltr PAN 12-61 of 26 Nov 1961
(b) Report No. NAEC AML 1760 of 14 Oct 1963
(NAEC ltr XM-44-AOS:lbg 10360/1 (1077) of 13 Nov 1963)
(c) BUWEPS ltr RRMA-53:SK/151 of 12 Nov 1963
(d) F. R. Project NAEC AML (17) R 360 FR 101 - The Permeation of Salt Water Through Organic Protective Coatings Using Radioactive Tracer Techniques

Encl: (1) S-N Curves of Specification MIL-P-8585 (Zinc Chromate Pigmentation) and Specification MIL-P-8585 (White Pigmentation) Coated Specimens

1. Reference (a) authorized work on the development of a meaningful laboratory test method for the rapid prediction of corrosion protective value of organic coatings and inhibitive pigments. Reference (b) reported on Krouse flexure fatigue studies conducted on specimens coated with inhibitive and non-inhibitive pigmented finishes after exposure to salt spray environment. Reference (b) concluded that all the coatings, whether pigmented with inhibitive or non-inhibitive pigments gave approximately equal Krouse fatigue results. In all cases, the specimens had been treated with specification MIL-C-5541 chemical film treatment before painting. Postulating that the presence of the specification MIL-C-5541 treatment could have contributed significantly to the lack of difference in fatigue results, reference (c) requested additional work omitting the specification MIL-C-5541 treatment. This work is reported herein.

2. A.(1) Two sets of Krouse sheet flexure fatigue specimens approximately 0.064 thick, fabricated from 7075-T6 aluminum alloy were coated on each side with 1 mil respectively of:

Set 1 - Specification MIL-P-8585 zinc chromate primer

Set 2 - Specification MIL-P-8585 type coating containing no zinc chromate.

No specification MIL-C-5541 chemical film preceded the painting. After drying for 7 days, the specimens were exposed for 720 hours in an acetic acid salt spray cabinet according to ASTM Method No. B287-61.

(2) After removal, each set of specimens was examined and then tested for flexure fatigue strength on Krouse Flexure Fatigue Testing machines. Visual examination of the specimens showed several areas of corrosion on all those coated with the primer containing no zinc chromate. However, only two of these specimens showed corrosion in the area where the metal was fatigued. No corrosion was noted on the specimens which were coated with zinc chromate primer. However, as can be seen from enclosure (1), the S-N curves are similar for both primers (except for the two specimens which corroded in the highly fatigued area) and are approximately the same as those obtained in reference (b) when the specification MIL-C-5541 had been used.

B.(1) In addition to the fatigue specimens prepared above, duplicate 3 inch by 6 inch 7075 aluminum alloy panels were coated (1 mil each side) as follows:

(a) MIL-E-7729 gloss enamel

(b) MIL-E-5556 camouflage enamel

(c) MIL-C-22750(WEP) gloss epoxy

(d) MIL-P-23377(WEP) epoxy primer (15.5% strontium chromate)

(e) MIL-P-8585 primer (15.5% zinc chromate)

(f) MIL-P-8585 primer (8.5% zinc chromate)

No specification MIL-C-5541 chemical film preceded the painting. After drying seven days, the panels were exposed for 720 hours in the acetic acid salt spray cabinet, removed and examined for corrosion.

(2) The panels coated with specifications MIL-E-7729 and MIL-E-5556 were corroded badly. All the others, including those coated with specification MIL-C-22750(WEP) gloss white epoxy which contained no inhibitive pigment, were essentially free of corrosion.

3. It is concluded that:

A. The Krouse fatigue procedure does not offer any promise as a meaningful accelerated test.

B. The panel test procedure shows some difference between coatings. However, both the chromate in the primers and the epoxy vehicle in the MIL-C-22750(WEP) coating seem to protect the metal. The part contributed by the vehicle is as yet not clear.

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4. This report is final and the subject problem assignment is considered closed; however, the basic objectives of reference (a, will be continued under problem assignment C 12 RMA 52-51, Development of Improved Inhibitive Primers. In addition, attempts will be made to correlate data on the protection afforded by organic coatings as determined by exposure to accelerated corrosion, with permeation data obtained by the techniques of reference (d).

R. L. [illegible]ELLOTT
By direction

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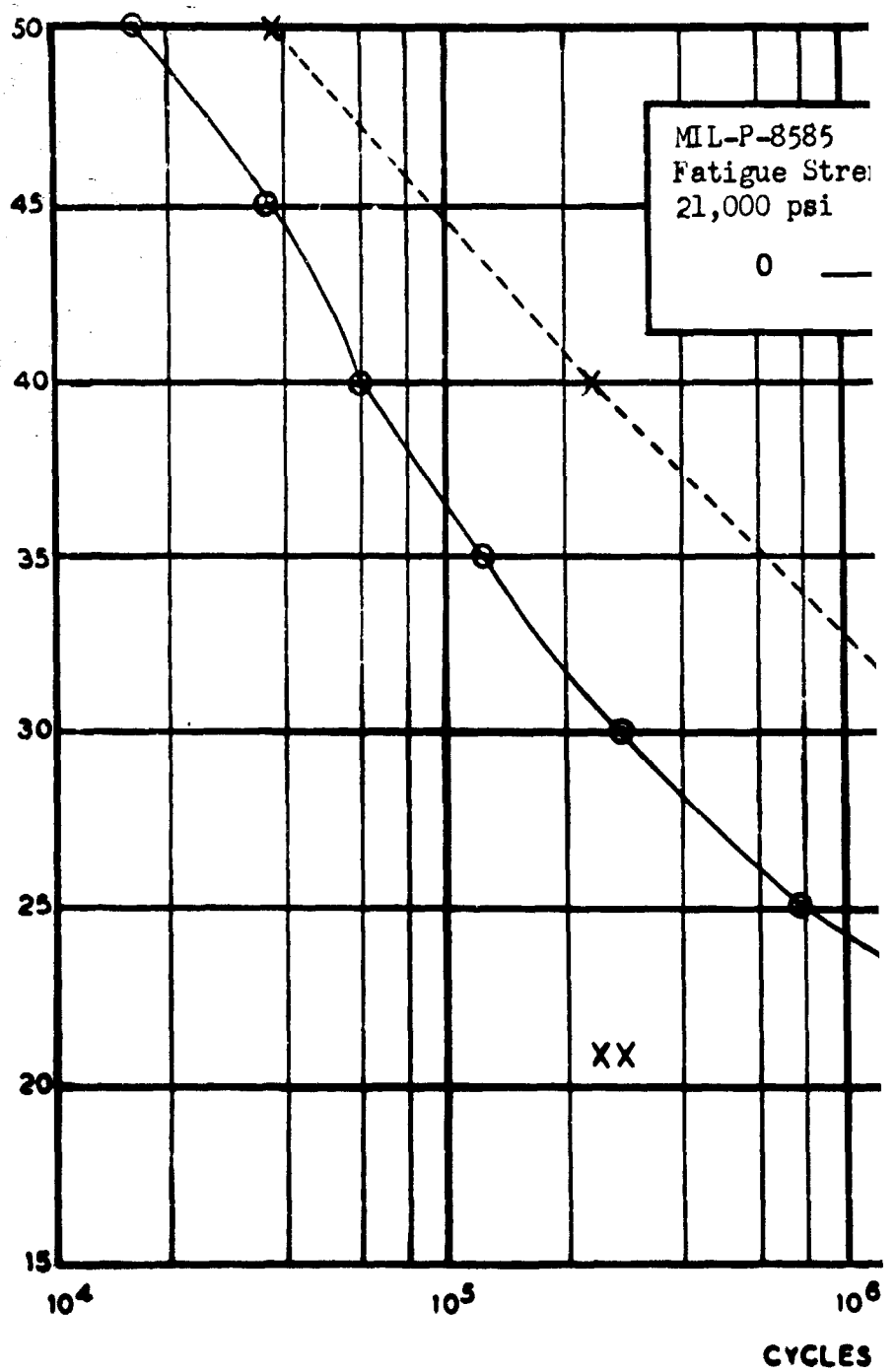
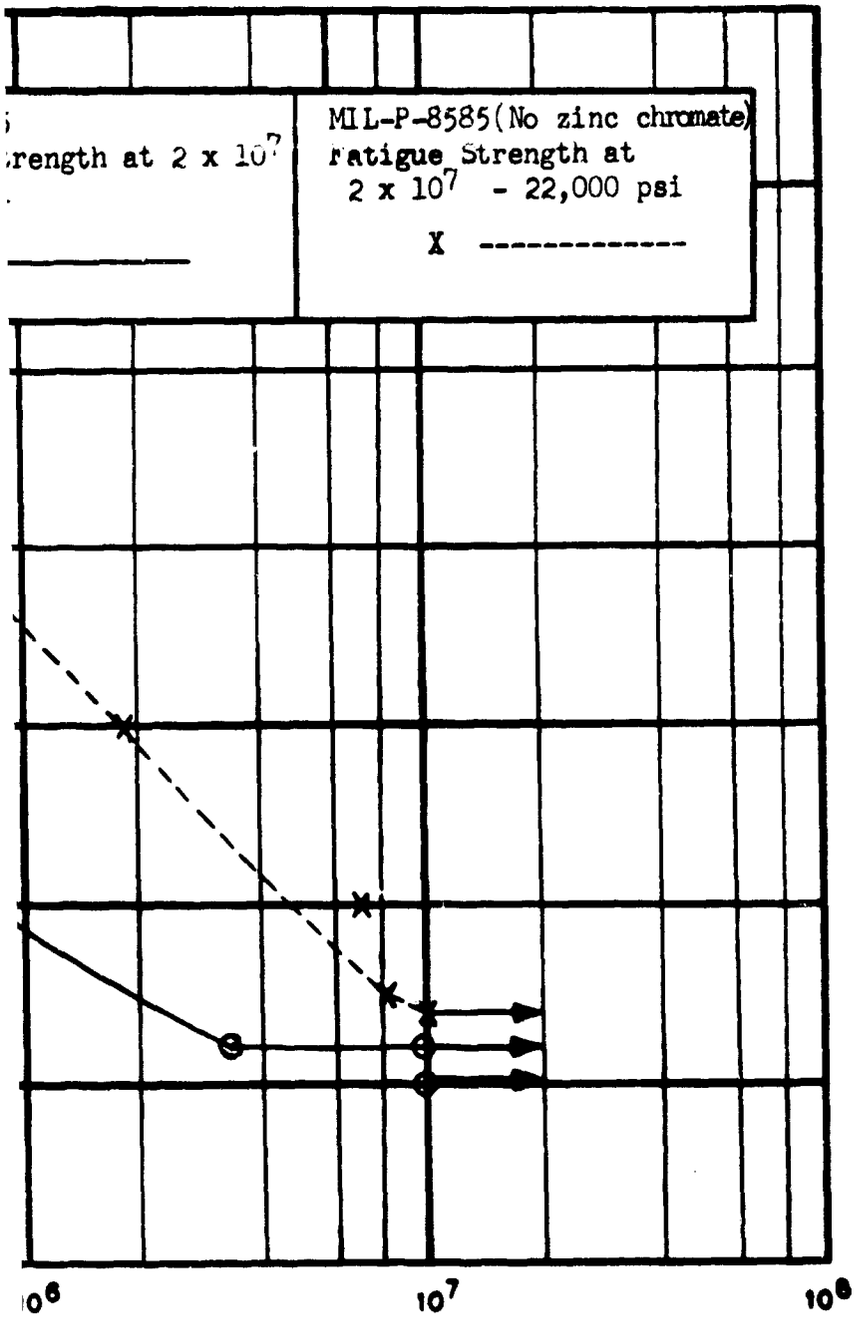
ENCLOSURE (1)





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